MC0303

RADIOISOTOPE SERVICES
A DESIGN GUIDE

DEPARTMENT OF HEALTH AND SOCIAL SECURITY
OCTOBER 1973

RADIOISOTOPE SERVICES

A DESIGN GUIDE

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RADIOISOTOPE SERVICES

A DESIGN GUIDE

FOREWORD

1. The need for guidance on the provision of radioisotope services arises from the increasing recognition of the value of radio-pharmaceuticals in diagnosis and treatment. At the present time there exists a substantial variation in the organisation of radioisotope services throughout the country and the purpose of this Design Guide is to promote the rationalisation of the service by establishing a framework within which regional options may be exercised.

2. The Guide takes into account the recommendations regarding level of service and local organisation made in the Report of the Working Party on the Organisation of Radioactive Isotope Services (the Windeyer Report) published by Her Majesty's Stationery Office in 1970 on behalf of the Department (No 126 in the series on Public Health and Medical Services (price 12½p)).

LEVELS OF PROVISION

3. The Report envisages a three-tiered organisation of the radioisotope services. The first level of provision, which will act as the focal point for the service in each regional area, should be a "Regional Radioisotope Centre" serving a population of at least 2 million. Apart from its functions of planning and organising the regional radioisotope services, of research and of staff training, its main purpose would be to provide a comprehensive service at a level and of a degree of specialisation that would be beyond the scope of the district general hospital. In fact the volume and complexity of the work carried out at a regional centre and the need for medical expertise in work directed towards the development of new tests and techniques may call for the establishment of a separate department of nuclear medicine headed by a medical consultant with a special interest in this field.

4. At the second level, it is considered that an efficient radioisotope service undertaking all but the most specialised work and serving areas where access to the regional centre is difficult should be developed at district general hospitals, though it is not anticipated that the establishment of this level of service at every district general hospital will be justified. The service at this level should be known as a "Sub-Regional Radioisotope Centre".

5. Service at a third level (which may be termed the "Radioisotope Unit") may be needed in places where, because of geographical factors, services at the sub-regional centre level are not easily available. Such a service could in some cases be provided at district general hospitals. The work of radioisotope units at this level may be expected to be restricted to routine tests, although the precise nature of such services would depend on the degree of development of the various medical specialties in the hospital concerned.

SCOPE

6. Guidance is not given in this document about the requirements at regional centre level. Some guidance is included on a service at the radiosotope unit level but this Guide concentrates on what is thought to be suitable provision at the second level, the sub-regional centre. It represents a considerable increase over what is usually provided at present and does so on the assumption that there is still a substantial unmet demand for the existing diagnostic uses of radiosotopes which can only be realised by an expansion of facilities.

NATURE OF THE SERVICE

7. Because diagnostic applications of radioisotopes present more serious organisational problems than do their therapeutic uses this Guide is concerned primarily with the use of radioisotopes in diagnosis. The function of a radioisotope service at the sub-regional centre level can be divided broadly into:

(a) Imaging - production of a pictorial representation of the distribution of radioactivity in an organ.
(b) Organ uptake - (including thyroid work)
(c) Dynamic studies
(d) Sample counting - the quantitative measurement of radioactivity in vitro.
(e) Occasional therapeutic application, which would be done in collaboration with the radiotherapy department and other interested clinicians.

To carry out these activities radioisotopes have to be received, stored, doses dispensed and samples prepared.

8. An important factor to be considered in planning an efficient service relates to the nature of the particular radioactive materials selected for use. An economic use of them will depend upon a balance being achieved between half-life of generators (ie "parent" isotopes), patient work-load and staff availability. As stated earlier the bulk of the work will be diagnostic so that doses of only a comparatively low level of radioactivity will normally be used. These can be

derived from generators of higher activity, the costs of which are not necesssrily proportional to their level of radioactivity. Therefore, if there are sufficient staff to cope with the workload it may be more economic to buy high-activity, long half-life generators from which a large number of test doses may be obtained. These considerations also apply to radioisotopes other than those eluted from generators. Purchase of high-activity stock solutions can prove economically advantageous wherever the radioisotope has a fairly long half-life.

RESPONSIBILITY FOR THE SERVICE

9. This Guide is based on the concept of a unified hospital radioisotope service under single administrative control and using mainly centralised accommodation since it is considered that this will be the most efficient arrangement for most purposes and besides avoiding duplication of staff, space and equipment will reduce the problems of radiological protection. A schedule of accommodation with recommended areas is given in Table 1 of Appendix A.

10. It is unlikely that the level and quantity of radioisotope work at the sub-regional centre will justify establishing a separate department on its own concerned with nothing else. The specialised accommodation that is required for radioisotope work should therefore be planned in close association with the accommodation of a parent department so that facilities such as offices, staff lavatories, general stores, utility rooms, main waiting, records etc. canbe shared. It is suggested that because of the importance of laboratory work in this kind of service overall administrative responsibility should be vested in the head of the department of pathology or in one of its specialised sub-departments e.g. biochemistry or haematology. If this arrangement is adopted it will be necessary to ensure that proper medical and nursing supervision is able to be given to patients being investigated and it may be necessary for overall responsibility for patient care to lie with a clinical consultant. Other possibilities would be for the unit to be included with any one of the departments of diagnostic X-ray, radiotherapy or medical physics. In these instances, medical and nursing supervision should already be available but it would be necessary to arrange for adequate cover for the biochemical and haematological aspects.

11. An estimation of the likely proportions of in vivo and in vitro work will help to determine which of the options described in the previous paragraph should be exercised but in some circumstances there may be valid reasons for adopting neither and for separating the in vivo and in vitro work. Should this be contemplated, however, the advantages of locating in vivo facilities in, say, the

department of diagnostic X-ray and in vitro facilities in the department of pathology should be weighed against the duplication that would arise of radioisotope storage and preparation, waiting and office space, as well as the likely increased difficulties of providing radiological protection. The probable accommodation requirements of a split unit are shown in Appendix A, Table 2; but it should be pointed out that the departmental costs quoted in the Departmental Cost and Area Guide (Hospital Building Procedure Note No. 6: Appendix 7, part of Capricode) are in respect of a centralised department only. A service provided from decentralised accommodation would, however, still require unification of administration for the safe and effective management of staff, patients, equipment and radioisotopes.

PLANNING CONSIDERATIONS WITHIN THE HOSPITAL

12. The avoidance of radioactive contamination and interference is of primary importance and the Code of Practice for the Protection of Persons against Ionizing Radiations arising from Medical and Dental Use (HMSO : 1972, price 60p) must be closely observed. In this respect an important factor which will influence both the sub-department's location within the hospital and also its own layout will be the level of radioactivity likely to be stored within the department; this in turn will depend to a large extent upon the availability of radioisotopes. At present most of these are obtained from the Radiochemical Centre at Amersham and are delivered or collected by a variety of means at different times of the week.

13. A laboratory which can rely on its regional centre for its pre-dispensed doses will require only a small high radioactivity area with consequent reduction in problems of layout and shielding.

14. A laboratory in an outlying area where the lines of supply are protracted might, however, have to carry out its own radiopharmacy and dispensing of both diagnostic and therapy doses, in which case the radioactivity levels could be comparatively high and the siting of the high activity area in relation to the rooms in which counting, imaging and film processing are carried out would have to be considered with particular care.

15. If a linking of this unit with the diagnostic X-ray department, as suggested in paragraph 10, is contemplated it must be remembered that in certain circumstances X-ray equipment can interfere with counting equipment, i.e. increase background counts, so that special precautions will have to be taken to avoid this interference.

16. The accommodation should be easily accessible from both the out-patient department and the wards with no steps to impede the movement of patients in wheelchairs or on trolleys. All procedures are able to be carried out within a constant ceiling height of 2.7m and door assemblies of 1m width are sufficient throughout except at the entrance to the unit and at all openings through which beds may pass where double-leaf assemblies will be needed.

17. The accommodation should be sited to minimise through traffic thus reducing the risk of contamination in the event of accidental spillage. It should also have separate connection direct to a main sewer for ease of disposal of radioactive liquid waste.

EQUIPMENT AND ACCOMMODATION - GENERAL REQUIREMENTS

HOSPITAL AT THE SUB-REGIONAL CENTRE LEVEL

18. The equipment and accommodation needed by a district hospital service will be determined by its functions. These are set out in paragraph 7. A diagram showing the possible layout of a sub-regional centre is given at Appendix B.

19. The basic items or types of specialised equipment needed will be:

(a) Imaging equipment, which would normally be a scanner.

(b) Uptake counter eg. thyroid.

(c) Other in vivo counter which may occasionally be of multiple detector type for dynamic studies.

(d) Equipment for in vivo sample counting.

The precise requirement will be determined by the type and quantity of work to be done. Apart from the above items the normal equipment of any radiation laboratory will also, of course, be needed.

20. The total number of rooms and the overall space requirement will depend upon the nature and quantity of work to be carried out and can only be determined for a particular hospital after a full study of design and organisation. If the functions of a radioisotope service as listed in paragraph 7 are to be performed, however, the following basic elements of accommodation will have to be included in any situation:

(a) High-activity area including isotope store and disposal.

(b) Room for imaging equipment.

(c) In vivo counting rooms.

(d) Tracer laboratory for in vitro studies.

(e) Technical room.

(f) Dark room.

(g) Clinical room.

(h) Office.

21. In addition to the above basic areas there will be a need for other general facilities such as reception, waiting, records, lavatories, offices, rest rooms, cleaners, stores etc. Some of this accommodation will be specific to the radioisotope unit but most of it will be contained by the parent department and would therefore be shared. Only if the radioisotope service is planned as a department on its own would it be necessary to provide this ancillary accommodation separately.

HOSPITAL AT THE RADIOISOTOPE UNIT LEVEL

22. As indicated in paragraph 5 the service at this level is likely to involve only the simpler in vivo or in vitro tests. The work would therefore be carried out in the hospital's pathology laboratory as part of the normal diagnostic service provided by that department.

23. The special radioisotope accommodation requirements will be unlikely to exceed:

(a) Radioisotope store/dispensary. ($16m^2$)

(b) Laboratory. ($21m^2$)

(c) Clinical investigation room. ($16m^2$)

The service would in every case be administered by a major hospital department which would include all necessary ancillary accommodation.

DESCRIPTION OF ACCOMMODATION

(NOTE: Guidance on the design of laboratories and radioisotope departments is given in Section 6.2 of the Code of Practice and on storage and movement of radioactive substances in Section 9.)

HOSPITAL AT THE SUB-REGIONAL CENTRE LEVEL

High radioactivity area.

24. This area should accommodate all procedures involving high levels of radioactivity and could be designed as a separate interconnecting unit. Its position in the sub-department and its size will depend upon the actual level of radioactivity being handled in it, the frequency of test procedures and the elected method of avoiding interference with counting/imaging equipment.

25. In general the dispensing and storage room(s) should be located as far away from counting and imaging equipment as can be conveniently arranged and this is particularly important if administration of therapeutic doses of radioisotope are planned or projected for the future. Planning in this manner could lead to significant economy in the amount of radiation shielding required to prevent radiation interference with apparatus. Detailed planning of radiation shielding should be undertaken in consultation with the Radiation Protection Adviser and will generally comprise of a combination of localised shielding of storage and dispensing areas, plus general shielding provided by the walls of the room. A protected area for storage will be required and this may entail provision of a lead lined or concrete safe but often an area surrounded with a lead brick wall (perhaps about 300mm high by 25mm thick) will be adequate since radioisotopes are often kept within the lead pots in which they are delivered. A lead lined cupboard or concrete well(s) will often be needed to store samples of urine or faeces and radioactive contaminated waste. The extent of cupboard shielding will depend on local arrangements for waste disposal since, in general it is bad practice to store any waste (particularly liquid) which can be discarded within the limits of a hospital's waste disposal certificate. Fume cupboards for dispensing (and storage of volatile radioisotopes and of generators) will require radiation shielding in the form of a lead brick wall over or around which an operator can work plus some lead protection on the floor of the fume cupboard. A pharmacist, biochemist or other comparable expert should be consulted in addition to the Radiation Protection Adviser on the choice of fume cupboard to ensure correct air flow and to ensure that the overall design allows procedures and cleaning to the level consistent with the preparation of intravenous injections. The necessity for shielding of the walls of the room(s) will depend on the level of radioactivity and the type of radioisotopes envisaged. The design of the localised shielding and the location of the room(s) may make wall shielding unnecessary. Where such shielding is deemed desirable, shielding may be necessary only for particular walls and in this respect it may be advantageous for one wall to be an outside wall. It may be more economical to build walls with special high density blocks made for such purposes rather than incorporating lead sheeting. It is important to realise that any benches and certainly fume cupboards, will need sufficiently strong supports to carry heavy lead shielding.

26. The area should include the following elements:

(a) Radioisotope store.

Isotopes may arrive at the hospital both within and outside normal laboratory working hours. During working hours they are taken from their bulky packaging (for which some holding space will be required - see sub-paragraph b. below) and stored until required for use. If a fairly close association with the rest of the accommodation is wanted then some form of protective store will be needed. It may be possible to design this store to accommodate also those isotopes whose activities have fallen below a usable level but which have to be stored until they have decayed to a level at which they are safe to discard. Contaminated items such as syringes and swabs might also be stored here until safe to incinerate.

(b) Holding store.

This will be for the temporary storage of packaging materials which will include cartons, canisters, expanded polystyrene and lead pots.

(c) Radiopharmacy.

This will be a Grade B laboratory (see Code of Practice) and will include at least one and possibly two fume cupboards and a worktop incorporating a sink with cold water supply. "Labelling", ie. the attachment of a radioisotope to a suitable pharmaceutical for test purposes, will be carried out here. It may be necessary in some instances to include a vestibule with lavatory basin, hand-monitoring equipment and facilities for donning protective gloves, gowns and possibly overshoes. This area should incorporate a shower for decontamination purposes in case of accidental spillage on a person if no such facility exists nearby.

(d) Sluice.

This will be needed for disposing of liquid waste, including body waste It could also act as a cleaners' room.

(e) The high-activity area would also be the place where therapeutic drinks are administered. Because of the high activity of such doses the layout of this area should make it possible for a patient to leave the sub-department directly without having to pass the counting rooms and upsetting the work being done in them.

Room for radioisotope imaging

27. A room about 5.4m x 4.2m is just adequate for procedures involving a scanner or a gamma camera. Even though initial requirements might demand the use of only one such item of major equipment it is recommended that space for a second (or other in vivo counting equipment, eg. renography apparatus) is provided at the

outset with a facility for screening one patient from the other where two are being examined simultaneously. It should be noted that a scanner is likely to weigh approximately 250 kg and a gamma camera 1000 kg.

Counting rooms (2)

28. One of these rooms will be used almost exclusively for measurements of thyroid function and another perhaps mainly for other in vivo organ counting. The equipment used in each of them, however, is mobile so that more flexible use of them will be possible if they are of equal size and are planned adjacent to one another with the facility of combining the two when necessary to accommodate space consuming procedures. Sufficient room in each should be allowed for a patient on a couch, counting equipment with associated electronic recorders, technician's desk and chair.

Tracer laboratory

29. This space should be to Grade C Standards (See Code of Practice mentioned in paragraph 12) and in it tracers will be prepared and radiation levels in specimens of blood and other fluids will be measured. Much of the work here is of a routine nature and shielding from radiation emission elsewhere in the sub-department is unnecessary providing this "background" level remains constant and low so that measuring equipment in the laboratory may be callibrated accordingly. The room should be sited away and well shielded from the high-activity area and any other sources of intermittently intense radiation.

Technical room

30. The function and size of this room will depend upon the relationship of the radioisotope unit with other hospital departments. It will serve primarily as a base for technicians and reporting, but its office characteristics may be supplemented by those of a workshop/store if maintenance of equipment is to be carried out within the unit by its own staff. This room could also serve as a base for any visiting physicist.

Dark room

31. An integral dark room will only be justified by a sufficient volume of work arising from scans or if the dark rooms of the X-ray department are too remote for use by the radioisotope sub-department.

Clinical room

32. A multipurpose room sited adjacent to the waiting area will be required for consultation, examination, obtaining blood samples and recovery of patients. It will serve as a base for nursing staff who would periodically be in attendance on patients being monitored. The room should contain a desk, chairs, patient's couch and a small work-station with worktop, sink with mixer taps, under and over bench drawers/cupboards (suitable for the storage and preparation of drugs and sterile materials). The equipment provided should include a ceiling-mounted examination lamp, oxygen and suction outlets, nurse call system indicators with staff emergency push and a telephone. The door should permit entry of a bed.

Office

33. A room will be required adjacent to the waiting area for patient data handling, film storage and as a reporting room for technical staff. It should be large enough for two people to use simultaneously each seated at desks and a telephone should be provided.

Waiting space

34. A separate waiting space for the sub-department is needed. Patients will wait to receive doses either by injection or as a drink and will wait again afterwards until the radiopharmaceuticals have circulated within the body. After imaging or counting the patients may have to wait until the results are checked. Time spent in waiting, therefore, will constitute a fairly high proportion of the total time spent by the patients in the sub-department. Some of them will have changed into gowns so the space should be screened in some way from any main traffic route.

Patients' lavatories

35. Because of the potentially lengthy periods of waiting and also on account of the need for some patients to supply urine samples after administration of a radiopharmaceutical, the sub-department should include its own WCs. Not more than two compartments will be needed and if each includes its own lavatory basin they may both be used by either sex. One compartment should be large enough to accommodate a wheelchair-borne patient.

Switch cupboard

36. A cupboard to house electrical distribution switchgear will be needed in a position to avoid cable lengths of more than about 30m from switchgear to furthest point served. It should be a minimum of 2.1m wide x 600mm deep, with doors or removable panels giving access to its entire width and to a height of 2m.

It should be sited in an area such as a corridor where its doors will remain unobstructed and preferably may open back fully during maintenance without themselves causing an obstruction.

37. As mentioned in paragraph 21 there will be a need for other facilities which would be provided by and shared with the parent department. These would include:-

(a) Reception area(s) for patients and samples
(b) Records store
(c) General and secretarial offices
(d) Office for administrative head of sub-department
(e) Staff changing room and lavatories
(f) Staff rest room
(g) Cleaners' room
(h) Store(s)

HOSPITAL AT THE RADIOISOTOPE UNIT LEVEL

Radioisotope store/dispensary

38. The location of this room is not so critical as its counterpart at the sub-regional centre level, though it should be sited away from the other two rooms in which radiation counting is carried out. It has several functions as follows:

(a) Reception and unpacking of radioisotopes: space should be allocated for holding packaging materials.
(b) Storage of radioisotopes and also non-radioactive pharmaceuticals. The activity level of isotopes used will not require the provision of an 'isotopes safe' with extraction. A refrigerator will be needed however to store those which require to be kept at a low temperature and a fume cupboard will also usually be needed in which to handle the more volatile isotopes such as Iodine 131.
(c) Labelling procedures will be carried out here for which pharmaceuticals incorporating radioisotopes will need to be prepared. The process will require a fully serviced fume cupboard and also a non-porous bench top capable of supporting a wall of protective lead bricks. The grade of the laboratory will depend on the level of radioactivity which is expected to be present. A Grade C may be sufficient but in some instances Grade B might be required (see Code of Practice)
(d) The room will also act as a store for those used items which have to be kept until their radioactivity has fallen to a level which would render them safe to discard.

Laboratory

39. This area is best located in chemical pathology and it could with advantage be sited among the range of laboratory work spaces in that sub-department, though it should not be used for any purpose other than low level in vitro radioisotope tests. It should be designed to Grade C Standards (see Code of Practice).

Clinical investigation room

40. All in vivo work will be carried out in this room. After a preliminary examination the patient will receive a diagnostic radioisotope dose and subsequent radiation from his body will be counted. Sufficient space must be allowed for the easy movement of a patient on a trolley and for freestanding items of counting equipment.

41. All other accommodation that is needed to support the specialised work carried out in the above three areas would be found in the pathology laboratory as part of that department's normal provision.

ENGINEERING SERVICES

42. The engineering services should follow general hospital practice and the guidance in both Hospital Building Note No. 15 (Revised) : Pathology Department and the Code of Practice mentioned in paragraph 12.

HEATING AND VENTILATION

43. Space heating requirements should be calculated on the following recommended design temperatures and ventilation rates, based on an outside temperature of minus 1 degree C:-

SPACE	TEMPERATURE °C	AIR CHANGES/HOUR
Radioisotope store and sluice*	18	10
Holding store	10	½
Radiopharmacy	18	6
Imaging room	18	6
Counting rooms	18	6
Tracer laboratory	18	10
Technical room	18	6
Dark room	18	6
Clinical room	18	6
Office	18	2
Waiting area	18	2
Patients' lavatories	18	2

*Attention is drawn to paragraph 106 of Hospital Building Note No. 15 (Revised) and the Code of Practice, Sub-sections 6.2.10 and 6.2.11, with particular reference to the ventilation of fume cupboards and areas of high radioactivity and to Sub-section 9.2.7 which covers the ventilation of radioisotope stores.

Gamma camera

44. Where a gamma camera is employed, air conditioning equipment capable of controlling temperature fluctuation to within ± 3°C per hour is essential, i.e. to within ± 3°C of the imaging room temperature (18°C). The gamma camera should be supplied from an essential circuit (see Technical Memorandum No. 11 - Emergency Electrical Services).

LIGHTING

45. Recommended values of illumination for the various rooms are as follows:-

SPACE	LUX
Radioisotope store	100
Holding store	80
Radiopharmacy	300
Sluice/cleaners' room	50
Imaging room	300
Counting rooms	300
Tracer laboratory	300
Technical room/technical workshop	200
Dark room	100
Clinical room*	200
Office	150
Waiting area	150
Lavatories	50
Corridors	50

* A ceiling-mounted examination light will be required in this room.

DRAINAGE

46. All drainage from this department should be connected directly to the main sewer and not connected in any way with the main hospital drainage systems. Guidance on disposal of radioactive waste is given in Section 10 of the Code of Practice.

SOCKET OUTLETS

47. Provision should be as in Hospital Building Note No. 15 (Revised), paragraph 155, Table 19. Socket outlets installed in fume cupboards must be of the flame-proof type.

ESSENTIAL SERVICES

48. All socket outlets are to be connected to the essential supply. Emergency lighting should be to grade (b) contained in Hospital Technical Memorandum No. 11 : Emergency Electrical Services.

PIPED MEDICAL GASES

49. Oxygen and vacuum outlets will be required in the clinical room, imaging room and counting rooms.

PATIENT/NURSE CALL

50. Nurse call buttons with staff emergency push will be required in the imaging and counting rooms and in WCs; only a staff emergency push will be necessary in the clinical room. The call system indicator should be sited in the clinical room with the repeater in the corridor outside and adjacent to the waiting area.

TELEPHONES

51. Telephones should be provided in the office, in the clinical, technical, counting and imaging rooms and in the tracer laboratory.

FIRE ALARMS AND FIRE FIGHTING EQUIPMENT

52. The need for adequate fire protection should be taken into account in the early stages of design. Reference should be made to Hospital Design Note No. 2 : Protection Against Fire and Hospital Technical Memorandum No. 16 : Fire Precautions. Advice on fire precautions should be sought from the Chief Officer of the local fire authority.

COMMUNICATIONS (PLANT ROOM)

53. A plant room to house the mechanical ventilation plant and other central services will be required. The area provided must allow adequate access for the maintenance of plant. The room should, preferably, be located within the area of the department and so sited that it does not interfere with the normal working of the department. In a multi-storey building it may not be possible to locate the plant room within the department and provision should therefore be made to site it on the roof. The construction should be designed to keep the emission of noise and vibration to acceptable limits. Natural ventilation of the room should, normally, be satisfactory. Where it can conveniently be arranged (e.g. within a whole hospital complex) the plant room may be shared with other departments. The area suggested is $10m^2$.

COST AND OTHER RELEVANT INFORMATION

COST CONTROL

54. For cost control purposes the lump sum Cost Guide figures for the various functional units shown in the Departmental Cost and Area Guide (Hospital Building Procedure Note No 6 : part of CAPRICODE), will be applicable. These figures include basic accommodation together with circulation and an allowance in respect of additional accommodation and/or additional engineering.

55. Departmental guidance documents recommend the standards of accommodation and services for hospital departments which the Department of Health and Social Security consider it reasonable to provide. Hospital Boards are at liberty to depart from the design recommendations given in such documents provided they are satisfied that the standards of accommodation and services they adopt are adequate. The Departmental Cost Allowance however is to be regarded as the maximum sum available for a department requiring the basic services specified in this Design Guide. Hospital Boards are encouraged to produce designs for the provision of appropriate accommodation and services at a cost less than the Departmental Cost Allowance.

56. The radioisotope services Cost Guide figures provide for the basic and additional accommodation detailed in paragraphs 24 to 36 above and for the engineering services detailed in paragraph 60 below.

APPORTIONMENT OF COSTS

57. An assessment of the notional cost apportionment between the building and engineering service elements should be made at Procedural Stage C1 (Provisional Cost Plan - Hospital Building Procedure Note No 1 : part of CAPRICODE).

CIRCULATION SPACE

58. For the purposes of preliminary planning the area occupied by internal circulation space and internal walls and partitions represents, on average, an addition of 29% of the net floor area of basic accommodation.

PLANT ROOMS

59. The plant room area shown in paragraph 53 is regarded as communication space. The area has been calculated for a single department scheme and some reduction in the area should be possible in a multi-department development.

ENGINEERING SERVICES

60. The following engineering services are included in the quoted cost of basic and additional accommodation shown in the Departmental Cost Guide.

(a) Mechanical services include:-

Heating	Low pressure hot water flush-fitting radiators.
Ventilation	Extract from radioisotope store, supply and extract from laboratories, clinical, counting, imaging, technical and dark rooms.
Hot and cold water services	From central supply. Not including calorifiers and storage tanks.
Medical gases	From central supply. Not including plant.
Fire protection	Supply from rising main to hose reel points.

(b) Electrical services include:-

Lighting (including fittings) socket outlets, wiring for all group 1 and 2 equipment, wiring for mechanical services, clocks, standby services wiring, distribution, switchgear, sub-mains within department, patient/nurse call, telephones, staff location system (including receivers) and fire alarms.

(c) Equipment includes:-

Mechanical equipment (Group 1 and 2) includes fume cupboards and examination lamp.

APPENDIX A

SCHEDULES OF ACCOMMODATION

Table 1

Centralised accommodation for a sub-regional radioisotope centre

Room or space	Suggested area m^2
Radioisotope store	5
Holding store	3
Radiopharmacy (Grade B Laboratory)	18
Sluice/cleaners' room	5
Imaging room	53
Counting rooms (2)	22
Tracer laboratory (Grade C Laboratory)	23
Technical room	11
Dark room	6.5
Clinical room	20
Office	18
Waiting area	11
Patients' lavatories (2)	7
Switch cupboard	1.5
	204
Circulation 29%	59
	263

Table 2.

Split accommodation for a sub-regional radioisotope centre

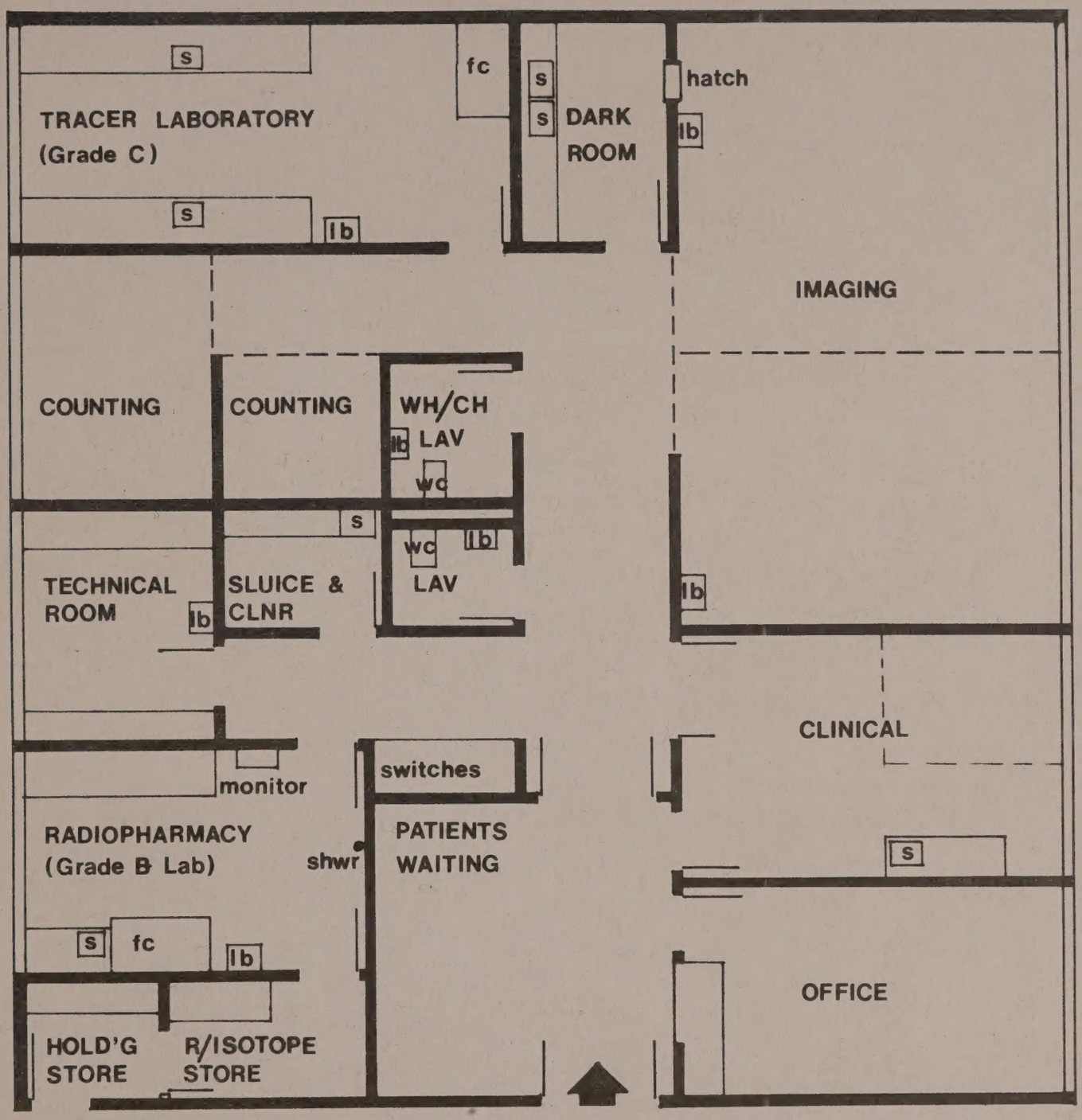
A. In vivo accommodation (associated with, say, diagnostic X-ray department)

Room or space	Suggested area m^2
Radioisotope store	4.5
Holding store	2.5
Radiopharmacy (Grade B Laboratory)	18
Sluice	3
Imaging room	53
Counting rooms (2)	22
Technical room	11
Clinical room	20
Office	16
Waiting area	11
Patients' lavatories (2)	7
	168
Circulation 29%	49
	217

B. In vitro accommodation (associated with pathology department)

Room or space	Suggested area m^2
Radioisotope store	4
Holding store	2
Radiopharmacy (Grade B Laboratory)	14
Sluice	2
Tracer laboratory (Grade C Laboratory)	23
Office/reporting room	11
	56
Circulation 29%	16
	72

APPENDIX B



Possible layout of a Sub-Regional Radioisotope Centre

Because of the low occupancy of the sub-department it may be assumed that its entrance will act also as the means of escape via the parent department. The local fire officer should , however , always be consulted.